PB-240 303

HANOVER POND, NEW HAVEN COUNTY, CONNECTICUT

Pacific Northwest Environmental
Research Laboratory

Prepared for:

National Environmental Research Center
Minnesota Pollution Control Agency
Minnesota National Guard

January 1975

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TECHNICAL REPORT DATA
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1. REPORT NO.	2.	PB 240 303
4. TITLE AND SUBTITLE: Report on Hanover Pond, New Haven County, Connecticut		5. REPORT DATE: Prepared January 1975 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S): Anonymous (National Eutrophication Survey Staff)		8. PERFORMING ORGANIZATION REPORT NO.: Working Paper # 180
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Pacific Northwest Environmental Research Laboratory U.S.Environmental Protection Agency 200 S. W. 35th St. Corvallis, Oregon 97330		10. PROGRAM ELEMENT NO.: 1BA029 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS: Office of Research and Development U.S. Environmental Protection Agency 401 M Street, S. W. Washington, DC 20460		13. TYPE OF REPORT AND PERIOD COVERED: Final - 1972 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114

16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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Springfield, VA. 22151

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

PRICES SUBJECT TO CHANGE

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
Release unlimited	20. SECURITY CLASS *(This page)*	22. PRICE
		40 3.75-2.25

EPA Form 2220-1 (9-73)

REPORT
ON
HANOVER POND
NEW HAVEN COUNTY
CONNECTICUT

EPA REGION I

WORKING PAPER No. 180

WITH THE COOPERATION OF THE

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

AND THE

CONNECTICUT NATIONAL GUARD

JANUARY, 1975

CONTENTS

	Page
Foreword	ii
List of Connecticut Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	3
III. Lake Water Quality Summary	4
IV. Nutrient Loadings	9
V. Literature Reviewed	14
VI. Appendices	15

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Connecticut Department of Environmental Protection for professional involvement and to the Connecticut National Guard for conducting the tributary sampling phase of the Survey.

John J. Curry, Director of the former Water Resources Commission; Roy B. Anderson, Principal Sanitary Engineer, and Steven Gerdsmeier, Sanitary Engineer, of the Water Compliance Unit, Department of Environmental Protection; and Sam Suffern, Assistant Director of Water and Related Resources, Department of Environmental Protection, provided invaluable lake documentation and counsel during the course of the Survey.

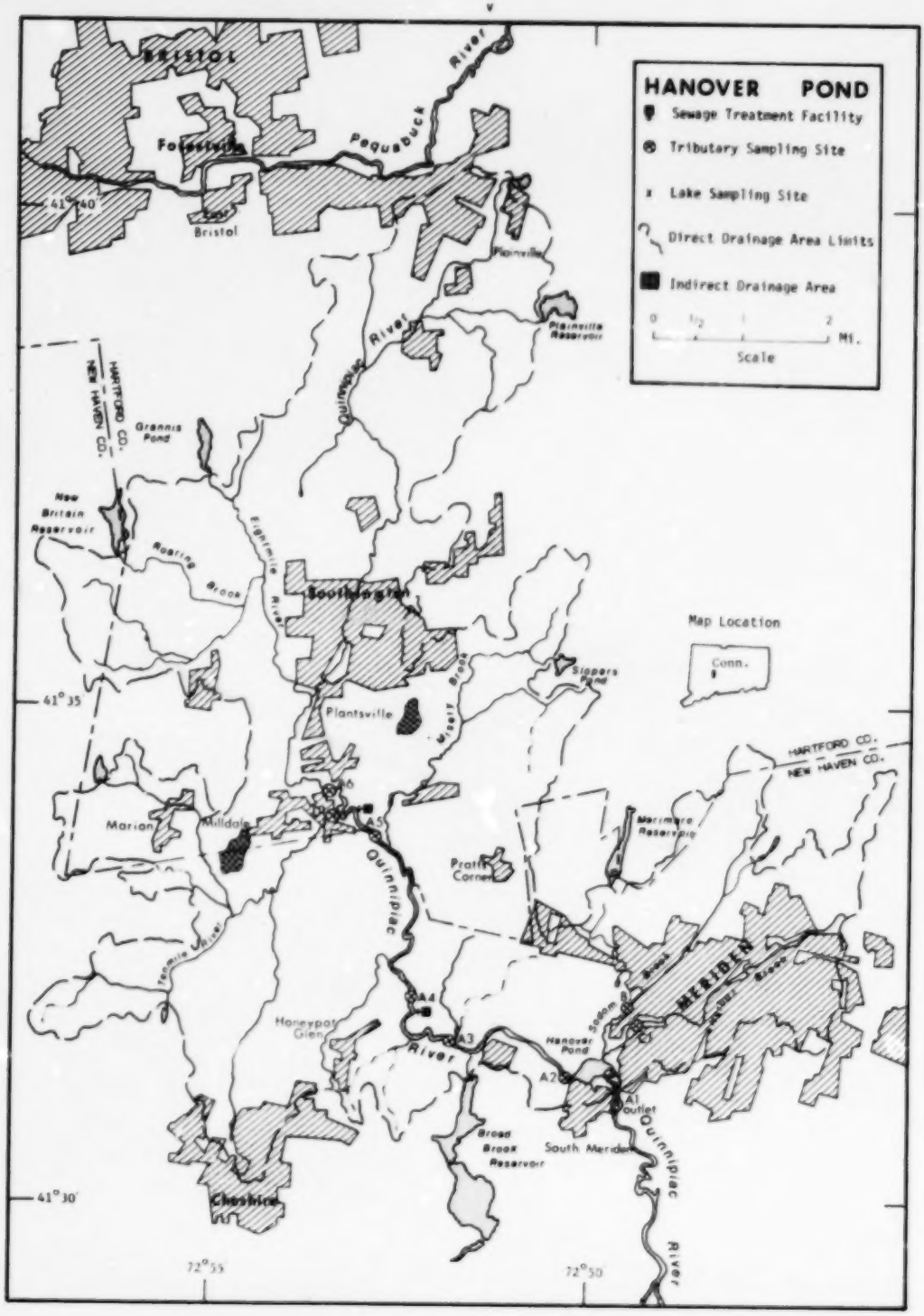
Major General John F. Freund, the Adjutant General of Connecticut, and Project Officer Lieutenant Colonel Daniel M. McGuire, who directed the volunteer efforts of the Connecticut National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF CONNECTICUT

LAKE NAME	COUNTY
Aspinook Pond	New London, Windham
Bantam	Litchfield
Community	New Haven
Eagleville	Tolland
Hanover Pond	New Haven
Housatonic Impoundments:	
Housatonic	Fairfield, New Haven
Lillinonah	Fairfield, Litchfield, New Haven
Zoar	Fairfield, New Haven


HANOVER POND
Sewage Treatment Facility
Tributary Sampling Site
Lake Sampling Site
Direct Drainage Area Limits
Indirect Drainage Area
0 1/2 1 2 Mi.
Scale
Map Location
Conn.
BRISTOL
Forestville
Bristol
Pequabuck River
Plainville
Plainville Reservoir
Quinnipiac River
HARTFORD CO.
NEW HAVEN CO.
Grannis Pond
New Britain Reservoir
Roaring Brook
Eightmile River
Southington
Sloppers Pond
Plantsville
Misery Brook
Marion
Milldale
Prattville Corner
Mirimere Reservoir
Quinnipiac River
Honeypot Glen
Hanover Pond
Broad Brook Reservoir
South Meriden
MERIDEN
Outlet
Cheshire
41°40'
41°35'
41°30'
72°55'
72°50'

HANOVER POND

STORET NO. 0905

I. CONCLUSIONS

A. Trophic Condition:

Hanover Pond is a hypereutrophic water body characterized by high turbidity and high nutrient levels on all sampling dates. Frequent algal blooms have been reported*.

B. Rate-Limiting Nutrient:

The results of the algal assay of the pond sample collected in May, 1973 indicate possible trace-element limitation.

The 1972 lake data indicate nitrogen limitation at all sampling times, (N/P ratios were 10/1 or less).

C. Nutrient Controllability:

1. Point sources--During the sampling year, Hanover Pond received a total phosphorus load at a rate more than 48 times the rate proposed by Vollenweider (in press) as "dangerous"; i.e., a eutrophic rate (see page 13). While Vollenweider's model may not be applicable to water bodies with very short hydraulic retention times, the hypereutrophic condition of Hanover Pond is evidence of the exceptionally large nutrient loading received.

It is calculated that the two point sources considered in this study contributed about 52% of the total phosphorus load.

* Anonymous, 1972.

Even complete removal of phosphorus at the two point sources would still leave a loading about 23 times the eutrophic rate, and it is concluded that control of phosphorus at the two point sources studied would not result in significant improvement in the trophic condition of Hanover Pond.

2. Non-point sources (see page 13)--The phosphorus exports of the Quinnipiac River and Harbor Brook were quite high during the sampling year (ca. four times the P export of Sodom Brook). The high export of the Quinnipiac River likely is due to point sources beyond the 25-mile limit of the Survey*, and the high export of Harbor Brook may be due to urban drainage in the City of Meriden.

In all, non-point sources are estimated to have contributed over 47% of the total phosphorus load to Hanover Pond during the sampling year.

* See Working Paper No. 1, "Survey Methods".

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 64 acres.
2. Mean depth: 4.5 feet.
3. Maximum depth: 9 feet.
4. Volume: 288 acre feet.
5. Mean hydraulic retention time: 20 hours.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
Quinnipiac River	76.9 mi^2	137.4 cfs
Sodom Brook	5.1 mi^2	9.3 cfs
Harbor Brook	11.9 mi^2	21.3 cfs
Minor tributaries & immediate drainage -	1.1 mi^2	2.4 cfs
Totals	95.0 mi^2	170.4 cfs

2. Outlet -

Quinnipiac River	95.1 mi^2**	170.4 cfs

C. Precipitation***:

1. Year of sampling: 64.9 inches.
2. Mean annual: 47.0 inches.

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† Anonymous, 1972.

* Drainage areas are accurate within ±1%; gaged mean daily and mean monthly flows are accurate within ±10%; ungaged mean daily and mean monthly flows are accurate within ±20%; and normalized mean monthly flows are accurate within ±10% for gaged streams and within ±12% (high flow) to 27% (low flow) for ungaged streams.

** Includes area of pond.

*** See Working Paper No. 1, "Survey Methods".

III. LAKE WATER QUALITY SUMMARY

Hanover Pond was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from one or more depths at a single station on the lake (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was collected for phytoplankton identification and enumeration; and a similar sample was taken for chlorophyll *a* analysis. During the last visit, a five-gallon depth-integrated sample was collected for algal assays. The maximum depth sampled was 8 feet.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the pond essentially was well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

		ALL VALUES (10/04/72)		
Parameter	Minimum	Mean	Median	Maximum
Temperature (Cent.)	14.8	14.8	14.8	14.8
Dissolved oxygen (mg/l)	10.6	10.6	10.6	10.6
Conductivity (μmhos)	280	280	280	280
pH (units)	7.3	7.5	7.5	7.8
Alkalinity (mg/l)	57	58	58	59
Total P (mg/l)	0.403	0.424	0.424	0.446
Dissolved P (mg/l)	0.356	0.369	0.369	0.382
$NO_2 + NO_3$ (mg/l)	1.960	2.000	2.000	2.040
Ammonia (mg/l)	0.400	0.470	0.470	0.540
		ALL VALUES		
Secchi disc (inches)	24	39	40	54

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
05/29/72	1. Trachelomonas	2,134
	2. Cyclotella	904
	3. Fragilaria	416
	4. Synedra	344
	5. Navicula	217
	Other genera	994
	Total	5,009
08/03/72	1. Navicula	579
	2. Nitzchia	542
	3. Chroococcus	452
	4. Dinobryon	398
	5. Cyclotella	380
	Other genera	1,356
	Total	3,707
10/04/72	1. Dinobryon	753
	2. Cryptomonas	392
	3. Nitzschia	271
	4. Navicula	271
	5. Achnanthes	211
	Other genera	1,024
	Total	2,922

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/29/72	01	13.1
08/03/72	01	11.0
10/04/72	01	32.5

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)	N/P Ratio
Control	0.154	1.546	44.9	10/1
0.010 P	0.154	1.546	44.0	9/1
0.020 P	0.174	1.546	47.3	9/1
0.050 P	0.204	1.546	65.9	8/1
0.050 P + 5.0 N	0.204	6.546	83.6	
0.050 P + 10.0 N	0.204	11.546	71.4	
10.0 N	0.154	11.546	47.0	

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Hanover Pond was very high at the time the sample was collected in May, 1973*.

With the N/P ratio of the control, the sample should have been nitrogen limited; and with the increased spikes of orthophosphorus, the samples should have become even more nitrogen

* Survey personnel collected an assay sample in October, 1972, but the sample was lost in shipment. Personnel of the Connecticut Department of Environmental Protection collected the May, 1973, sample used for the assay.

limited. However, the 0.05 mg/l orthophosphorus spike resulted in a marked increase in yield despite a N/P ratio of 8/1 (which indicates the sample was nitrogen limited). Also, with a nitrogen-limited control sample, the addition of nitrogen should have resulted in a yield much greater than the control yield. Note, however, that the nitrogen-only spike resulted in a yield not significantly greater than the control yield.

The results, then, indicate the growth of the test alga in the assay sample was limited by something other than phosphorus or nitrogen. Possibly a trace element (i.e., a contaminant) was present in sufficient quantity in the largest orthophosphorus spike to stimulate a growth response but was absent or of insufficient quantity in the nitrogen-only spike.

The 1972 pond data indicate nitrogen limitation at all sampling times. All of the N/P ratios were 10/1 or less, and nitrogen limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the Connecticut National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for periods of no flow or ice cover when samples were omitted at some of the stations. Sampling was begun in August, 1972 and was completed in September, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Connecticut District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. The nutrient loads given for the Quinnipiac River are those measured at station A-2 minus the point source loads. The phosphorus load determined in this way approximated (85 percent) that obtained by using upstream (station A-6) phosphorus concentrations and A-2 flows. However, by either method of calculation, this "non-point" loading is approximately five times the anticipated non-point loading estimates obtained by using Sodom Creek phosphorus concentrations and inlet flows.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the

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* See Working Paper No. 1.

nutrient loads, in lbs/mi^2/year, in Sodom Brook at station B-1 and multiplying the means by the ZZ area in mi^2.

The operators of the Cheshire and Southington wastewater treatment plants provided monthly effluent samples and corresponding flow data.

A. Waste Sources:

1. Known muncipal* -

Name	Pop. Served	Treatment	Mean Flow (mgd)	Receiving Water
Southington	22,000	trickling filter	3.896	Quinnipiac River
Cheshire	2,000	act. sludge	0.238	Quinnipiac River

2. Known industrial - No industrial sources have been identified.

* Armet, 1973.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
Quinnipiac River	51,680	41.4
Sodom Brook	810	0.6
Harbor Brook	6,590	5.3
b. Minor tributaries & immediate drainage (non-point load) -	170	0.1
c. Known municipal -		
Southington	59,670	47.9
Cheshire	5,760	4.6
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	10	<0.1
Total	124,690	100.0

2. Outputs -

Lake outlet - Quinnipiac River 124,450

3. Net annual P accumulation - 240 pounds

* See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/yr	% of total
a. Tributaries (non-point load) -		
Quinnipiac River	421,320	54.1
Sodom Brook	30,290	3.9
Harbor Brook	86,190	11.1
b. Minor tributaries & immediate drainage (non-point load) -	6,530	0.8
c. Known municipal -		
Southington	217,920	28.0
Cheshire	15,590	2.0
d. Septic tanks - Unknown	-	-
e. Known industrial - None	-	-
f. Direct precipitation* -	620	<0.1
Total	778,460	100.0

2. Outputs -

Lake outlet - Quinnipiac River 839,390

3. Net annual N loss - 60,930 pounds

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs $P/mi^2/yr$	lbs $N/mi^2/yr$
Quinnipiac River	672	5,479
Sodom Brook	159	5,939
Harbor Brook	554	7,243

* See Working Paper No. 1.

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with very short detention times.

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	1,948.3	3.8	12,163.4	loss*
grams/m^2/yr	218.37	0.42	1,363.3	-

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Hanover Pond:

"Dangerous" (eutrophic rate)	4.50
"Permissible" (oligotrophic rate)	2.25

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the pond, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, unknown and unsampled point sources discharging directly to the pond, or the limits of accuracy of the flow estimates provided by U.S.G.S. (see page 3).

Whatever the cause, a similar nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been studied intensively by EPA's National Eutrophication Research and Lake Restoration Branch.

V. LITERATURE REVIEWED

Anonymous, 1972. Survey questionnaire. CT Dept. Env. Prot., Hartford.

Armet, Brian W., 1973. Wastewater treatment plant questionnaires. CT Dept. Env. Prot., Hartford.

Vollenweider, Richard A. (in press). Input-output models. Schweiz. Z. Hydrol.

VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR CONNECTICUT 11/26/74

LAKE CODE 0905 HANOVER POND

TOTAL DRAINAGE AREA OF LAKE 95.10

TRIBUTARY	SUB-DRAINAGE AREA	NORMALIZED FLOWS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
0905A1	95.10	204.80	217.00	337.00	300.40	197.60	124.20	81.83	79.38	86.78	93.10	151.40	174.70	178.36
0905A2	76.90	165.00	175.00	266.00	236.00	159.00	107.00	72.00	66.00	75.00	76.00	118.00	137.00	137.40
0905B1	5.15	11.00	12.00	20.00	18.00	11.00	5.00	2.60	3.80	3.20	4.90	9.80	11.00	9.34
0905C1	11.90	26.00	27.00	46.00	42.00	25.00	11.00	6.70	8.70	7.90	11.00	21.00	24.00	21.32
0905Z2	1.20	2.80	3.00	5.00	4.40	2.60	1.20	0.53	0.88	0.68	1.20	2.60	2.70	2.29

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 95.10
SUM OF SUB-DRAINAGE AREAS = 95.15
TOTAL FLOW IN = 2048.19
TOTAL FLOW OUT = 2048.19

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
0905A1	8	72	126.00	19	113.00				
	9	72	74.00	28	68.00				
	10	72	119.00						
	11	72	282.00						
	12	72	456.00						
	1	73	338.00						
	2	73	463.00						
	3	73	276.00	18	532.00				
	4	73	419.00	8	385.00				
	5	73	303.00	5	265.00				
	6	73	168.00	2	229.00	12	144.00		
	7	73	163.00						
	8	73	93.00	29	66.00				
	9	73	91.00	22	78.00				
	10	73	73.00						
0905A2	8	72	105.00	19	94.00				
	9	72	64.00	28	59.00				
	10	72	96.00						
	11	72	228.00						
	12	72	368.00						
	1	73	274.00						
	2	73	374.00						
	3	73	238.00	18	458.00				
	4	73	361.00	8	333.00				
	5	73	245.00	5	215.00				
	6	73	136.00	2	185.00	12	116.00		
	7	73	132.00						
	8	73	75.00	29	53.00				
	9	73	74.00	22	63.00				
	10	73	59.00						

TRIBUTARY FLOW INFORMATION FOR CONNECTICUT 11/26/74

LAKE CODE 0905 HANOVER POND

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
090541	8	72	6.00	19	5.40				
	9	72	2.70	28	2.50				
	10	72	6.50						
	11	72	15.00						
	12	72	25.00						
	1	73	18.00						
	2	73	25.00						
	3	73	12.00	18	23.00				
	4	73	18.00	8	16.00				
	5	73	16.00	5	14.00				
	6	73	9.10	2	12.00	12	7.80		
	7	73	8.80						
	8	73	5.00	29	3.60				
	9	73	5.00	22	4.20				
	10	73	3.90						
090561	8	72	14.00	19	12.00				
	9	72	6.70	28	6.20				
	10	72	15.00						
	11	72	35.00						
	12	72	57.00						
	1	73	42.00						
	2	73	58.00						
	3	73	24.00	18	46.00				
	4	73	36.00	8	33.00				
	5	73	38.00	5	33.00				
	6	73	21.00	2	29.00	12	18.00		
	7	73	20.00						
	8	73	12.00	29	8.20				
	9	73	11.00	22	9.70				
	10	73	9.10						
090577	8	72	1.40	19	1.20				
	9	72	0.58	28	0.54				
	10	72	1.50						
	11	72	3.60						
	12	72	5.70						
	1	73	4.30						
	2	73	5.80						
	3	73	2.40	18	4.60				
	4	73	3.60	8	3.30				
	5	73	3.80	5	3.40				
	6	73	2.10	2	2.90	12	1.80		
	7	73	2.10						
	8	73	1.20	29	0.80				
	9	73	1.10	22	1.00				
	10	73	0.90						

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/11/26

090501
41 31 16.0 072 49 38.0
HANOVER POND
09 CONNECTICUT

11EPALES 2111202
3 0009 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/29	15	50 0000	18.7	11.0	54	250	7.40	54	1.300	0.220	0.317	0.203
	15	50 0008	16.8	11.0		360	7.30	59	1.300	0.330	0.280	0.175
72/08/03	17	00 0000			24	250	7.30	62	1.120	0.180	0.198	0.149
	17	00 0004	21.5	7.8		210	7.00	79	0.420	0.110	0.032	0.028
72/10/04	08	20 0000			40	280	7.75	59	2.040	0.400	0.403	0.356
	08	20 0004	14.8	10.6		280	7.25	57	1.960	0.540	0.446	0.382

19

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/29	15	50 0000	13.1J
72/08/03	17	00 0000	11.0J
72/10/04	08	20 0000	32.5J

J VALUE KNOWN TO BE
IN ERROR

APPENDIX C

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 74/11/26

0905A1 0903A4
41 31 00.0 072 49 30.0
QUINNIPAC RIVER
09 7.5 MERIDEN
O/HANOVER POND
ST HWY 70 BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19			0.540	1.000	0.126	0.220	0.265
72/10/02	15 55		2.090	1.450	0.390	0.379	0.490
72/10/31	10 15		1.580	1.225	0.420	0.400	0.540
73/03/18	13 30		0.580	0.650	0.100	0.054	0.120
73/04/08	14 00		0.560	0.807	0.069	0.052	0.120
73/05/05	10 40		0.960	1.260	0.290	0.170	0.260
73/06/12	21 00		1.200	2.500	0.300	0.150	0.270
73/08/29	07 10		1.920	1.300	0.380	0.690	0.820
73/09/22	08 30		1.700	1.300	0.540	0.320	0.500

STORET RETRIEVAL DATE 74/11/26

0905A2 LS0905A2
41 31 30.0 072 50 30.0
QUINNIPIAC RIVER
09 7.5 MERIDEN
I/HANOVER POND
OREGON RD BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19	12 00		1.825	1.000	0.530	0.490	0.610
72/10/02	16 00		0.670	1.550	0.620	0.380	0.485
72/10/31	09 40		1.500	1.620	0.810	0.420	0.550
72/11/21	11 35		0.700	0.725	0.260	0.074	0.145
73/03/18	13 00		0.580	0.955	0.066	0.054	0.105
73/04/08	14 35		0.580	0.420	0.088	0.054	0.105
73/05/05	11 00		0.950	1.600	0.220	0.180	0.250
73/06/12	21 25		1.540	1.320	0.252	0.240	0.310
73/08/29	07 15		1.900	1.250	0.510	1.000	1.150
73/09/22	08 00		1.740	1.760	0.540	0.415	0.625

STORET RETRIEVAL DATE 74/11/26

0905A3 LS0905A3
41 32 00.0 072 52 00.0
QUINNIPIAC RIVER
09 7.5 MERIDEN
T/HANOVER POND
WESTERN CHESHIRE ST BRDG BELOW STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19	12 00		0.660	1.100	0.590	0.195	0.320
72/10/02	16 10		0.512	2.150	0.920	0.155	0.802
73/03/18	14 30		0.600	0.420	0.083	0.056	0.110
73/04/08	14 30		0.580	0.850	0.094	0.054	0.110
73/05/05	10 50		1.020	3.400	0.280	0.189	0.260
73/06/12	21 05		1.640	2.200	0.380	0.350	0.430
73/08/29	07 20		1.700	0.960	0.580	0.760	0.860
73/09/22	08 15		1.600	7.600	0.399	0.510	3.400

STORET RETRIEVAL DATE 74/11/26

0905A4 LS0905A4
41 32 00.0 072 52 30.0
QUINNIPIAC RIVER
09 7.5 MERIDEN
T/HANOVER POND
BLACKS RD BRDG ABOVE CHESHIRE STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19	11 40		0.700	1.000	0.440	0.315	0.430
72/10/02	16 20		0.690	1.150	0.483	0.350	0.470
72/10/31	10 00		0.330	1.500	0.880	0.060	0.595
72/11/21	11 30		0.720	0.500	0.115	0.080	0.135
73/03/18	14 15		0.610	0.500	0.126	0.056	0.110
73/04/08	14 15		0.610	0.780	0.138	0.058	0.110
73/05/05	10 45		0.980	2.800	0.270	0.150	0.240
73/06/12	21 10		1.560	2.000	0.750	0.480	0.590
73/08/29	07 30		1.680	1.760	0.440	0.670	0.770
73/09/22	08 10		1.700	2.300	0.860	0.860	1.000

STORET RETRIEVAL DATE 74/11/26

0905A5 LS0905A5
41 34 00.0 072 53 00.0
QUINNIPIAC RIVER
09 7.5 SOUTHINGTON
T/HANOVER
ST HWY 66 BRDG BELOW SOUTHINGTON STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19	09 50		0.530	1.100	0.660	0.394	
72/09/23	09 45		0.373	1.750	0.740	0.135	0.345
72/10/29	10 00		0.830	2.730	1.500	0.430	0.840
72/11/19	09 30		0.480	0.720	0.390	0.200	0.290
72/12/26			1.100	0.850	0.420	0.130	0.240
73/01/18	13 00		1.600	1.380	0.730	0.340	0.450
73/02/10	13 00		1.520	0.750	0.410	0.220	0.300
73/03/20	12 00		1.200	0.950	0.550	0.280	0.375
73/04/12	08 00		0.860	0.460	0.132	0.168	0.220
73/04/22	09 00		0.870	1.510	0.189	0.168	0.230
73/05/30	12 30		0.840	1.380	0.550	0.290	0.420
73/08/14	09 20		1.480	2.500	0.620	0.520	0.620
73/09/05	11 35		1.400	3.500	1.050	0.750	0.945

STORET RETRIEVAL DATE 74/11/26

0905A6 LS0905A6
41 34 00.0 072 53 30.0
QUINNIPIAC RIVER
09 7.5 SOUTHINGTON
T/HANOVER POND
OLD TURNPIKE RD BRDG ABV SOUTHINGTON STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19	10	15	1.440	0.700	0.367	0.189	0.300
72/09/23	09	15	0.830	0.350	0.110	0.303	0.410
72/10/29	10	30	0.830	0.980	0.086	0.176	0.294
72/12/26			1.100	0.630	0.168	0.095	0.189
73/01/18	13	00	1.840	0.370	0.198	0.168	0.250
73/02/10	12	00	1.720	0.560	0.300	0.154	0.220
73/03/20	12	00	1.440	0.230	0.050	0.240	0.310
73/04/12	09	25	0.910	0.360	0.058	0.190	0.240
73/04/22	09	15	0.920	0.810	0.128	0.190	0.250
73/05/30	12	20	0.940	0.870	0.410	0.210	0.300
73/08/14	09	40	1.120	1.470	0.072	0.028	0.068
73/09/05	11	50	1.220	1.050	0.042	0.027	0.165

STORET RETRIEVAL DATE 74/11/26

0905B1 LS0905B1
41 32 00.0 072 49 30.0
SODOM BROOK
09 7.5 MERIDEN
T/HANOVER POND
COE AVE BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19	11 35		0.890	0.275	0.063	0.015	0.039
72/09/30	15 45		0.900	0.450	0.067	0.015	0.037
72/10/31	09 25		0.820	0.365	0.048	0.014	0.040
72/11/21	11 10		1.100	0.500	0.180	0.023	0.040
73/03/18	14 10		0.970	0.380	0.033	0.015	0.035
73/04/08	13 15		0.990	0.420	0.037	0.015	0.035
	13 20		1.000	1.500	0.076	0.018	0.037
73/05/05	10 30		0.910	1.380	0.056	0.023	0.040
73/06/12	20 00		0.910	1.200	0.160	0.039	0.080
73/08/29	07 05		0.750	0.460	0.050	0.025	0.060
73/09/22	09 55		0.810	1.320	0.120	0.042	0.050

STORET RETRIEVAL DATE 74/11/26

0905C1 LS0905C1
41 32 00.0 072 49 30.0
HARBOR BROOK
09 7.5 MERIDEN
T/HANOVER POND
COE AVE HRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/14	11 30		0.450	0.500	0.105	0.056	0.110
72/10/02	15 50		0.650	1.000	0.158	0.039	0.101
72/10/31	09 15		0.930	0.440	0.064	0.048	0.105
73/03/18	14 00		1.060	1.050	0.066	0.063	0.180
73/04/08	13 30		1.080	0.720	0.069	0.063	0.170
73/05/05	10 33		1.000	0.660	0.061	0.051	0.085
73/06/02	08 30		1.100	2.730	0.870	0.176	0.270
73/08/29	07 00		0.830	0.540	0.060	0.168	0.260
73/09/22	07 50		1.200	2.800	0.150	0.075	0.170

STORET RETRIEVAL DATE 74/11/26

0905D1 LS0905D1
41 34 00.0 072 53 30.0
TENMILE RIVER
09 7.5 SOUTHINGTON
T/HANOVER POND
OLD TURNPIKE RD BRDG ABV SOUTHINGTON STP
11FPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/08/19	09 55		0.500	1.400	0.140	0.029	0.029
72/09/23	09 30		0.550	0.250	0.085	0.015	0.031
72/10/28	10 15		1.100	0.450	0.095	0.015	0.050
72/11/19	09 00		1.060	0.260	0.072	0.017	0.030
72/12/26			1.040	0.440	0.086	0.019	0.044
73/01/18	13 30		1.500	0.310	0.087	0.016	0.042
73/02/10	13 00		1.300	0.220	0.069	0.015	0.040
73/03/20	12 15		1.100	0.230	0.029	0.016	0.030
73/04/12	09 20		0.740	0.360	0.030	0.012	0.025
73/04/23	09 20		0.750	0.330	0.037	0.015	0.030
73/05/30	12 25		0.740	0.440	0.052	0.017	0.035
73/08/14	09 30		1.920	1.260	0.042	1.500	1.880
73/09/05	11 45		1.520	1.980	0.092	1.500	1.800

STORET RETRIEVAL DATE 74/11/27

090551 AS090551 P002000
41 32 00.0 072 52 00.0
CHESHIRE
09 7.5 MERIDEN
T/HANOVER POND
QUINNIPIAC RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/24	07 30								
CP(T)-			21.200	2.100	0.580	7.700	8.100	0.237	0.254
73/01/24	12 00								
73/02/15	07 30								
CP(T)-			11.200	1.470	1.050	5.200	5.600	0.241	0.260
73/02/15	12 30								
73/03/08	07 30								
CP(T)-			2.100		0.330	4.200	4.300	0.230	0.240
73/03/08	12 30								
73/03/29	07 30								
CP(T)-			11.200	1.010	1.010	6.250	6.800	0.243	0.235
73/03/29	12 30								
73/04/26	07 30								
CP(T)-			24.000	4.200	0.210	9.400	9.900	0.214	0.225
73/04/26	12 00								
73/05/16	07 30								
CP(T)-			23.600		0.280	6.900	7.200	0.246	0.252
73/05/16	12 30								
73/06/08	07 30								
CP(T)-			15.200	2.310	0.253	5.900	6.100	0.243	0.250
73/06/08	12 30								
73/08/09	07 30								
CP(T)-			19.800	0.420	0.056	6.600	6.100	0.217	0.234
73/08/09	12 30								
73/09/13	07 30								
CP(T)-			24.200		0.198	0.170	8.400	0.222	0.230
73/09/13	12 00								
73/10/04	07 30								
CP(T)-			24.000	0.350	0.140	9.400	9.800	0.230	0.230
73/10/04	12 30								
73/11/14	07 30								
CP(T)-			23.000	0.500K	0.170	8.400	8.550	0.216	0.225
73/11/14	12 30								
73/11/27	07 30								
CP(T)-			25.000	0.500K	0.175	8.375	8.800	0.225	0.225
73/11/27	12 30								

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/27

0#0551 AS090551 P002000
41 32 00.0 072 52 00.0
CHESHIRE
09 7.5 MERIDEN
T/HANOVER POND
QUINNIPIAC RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLO# MGD MONTHLY
73/12/06 CP(T)- 73/12/06	07 30 12 30		24.000	0.500K	0.130	R.000	R.000	0.237	0.234

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/27

090552 TF090552 P022030
41 34 00.0 072 53 00.0
SOUTHINGTON
09 7.5 SOUTHINGTON
T/HANOVER POND
QUINNIPIAC RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/01/03	07 30								
CP(T)-			1.560	12.000	3.800	2.300	3.300	4.300	4.520
73/01/03	16 30								
73/02/21	00 00								
CP(T)-			0.770	14.700	3.000	3.000	4.200	4.450	5.000
73/02/21	07 30								
73/04/03	07 00								
CP(T)-			0.820	13.800	3.350	2.450	3.900	5.250	4.460
73/04/03	15 00								
73/05/16	00 00								
CP(T)-			0.700	13.800	4.600	2.900	4.200	4.480	4.570
73/05/16	08 00								
73/06/10	00 00								
CP(T)-			1.200	15.000	5.900	4.080	5.650	3.930	4.400
73/06/10	07 00								
73/07/23	00 00								
CP(T)-			2.700	17.000	7.000	4.200	6.100	3.700	3.730
73/07/23	07 30								
73/08/30	00 00								
CP(T)-			1.300	24.000			6.600	3.260	3.320
73/08/30	07 30								
73/09/26	00 00								
CP(T)-			1.320	20.000	8.800	5.400	6.600	3.240	3.120
73/09/26	07 00								
73/10/25	07 00								
CP(T)-			0.880	19.500	7.400	5.600	7.400	3.020	3.040
73/10/25	15 00								
73/11/29	00 00								
CP(T)-			0.880	30.000	17.000	4.300	5.600	3.040	2.990
73/11/29	07 00								
74/01/02	07 00								
CP(T)-			1.920	15.800	4.600	3.000	3.900	4.360	3.710
74/01/02	15 00								